grid 3. The potential gradient on the beam axis is at least 10 kV/mm. These conditions have a favorable effect on the beam-spot diameter.

TABLE 2

	Invented electron gun	Conventional gun
G_{2t} (thickness)	$0.25D_{G2}$ to $0.5D_{G2}$	$0.6D_{G2}$ to $1.2D_{G2}$
G_{1-2} (separation)	$0.25D_{G2}$ to $0.5D_{G2}$	$0.6D_{G2}$ to $1.0D_{G2}$
G_{2-3} (potential gradient)	9 to 12 kV/mm	4 to 7 kV/mm

FIG. **14** shows the result of an electron-trajectory analysis done on the basis of the above dimensions. Beam current is shown on the horizontal axis, and the predicted size of the beam spot on the screen is shown on the vertical axis. An improvement of about 10% over the conventional electron gun is predicted at medium and high beam current levels, and an improvement of 5% is predicted at low current levels. The invention is also predicted to produce less variation in the size of the beam spot as the current level varies.

In the electron gun of the present invention as described above, to produce only convex lens effects in the triode **14**, it was necessary to make the second grid **4** thinner and reduce the separation between the first grid **3** and second grid **4**. When this is done, if the voltage E_{G2} applied to the second grid **4** has the conventional value, then the potential difference between the cathodes **2** and the second grid **4** is substantially seven hundred volts in the cut-off state. The cut-off state is defined as the state in which the beam spot is visually extinguished on the screen. Since the second grid **4** is closer to the first grid **3**, to obtain the same beam current as before, the separation between the first grid **3** and cathode **2** must be widened, with consequent adverse effects on the drive characteristic.

The voltage E_{G2} applied to the second grid **4** should therefore be reduced so that the potential difference between the cathodes **2** and the second grid **4** is four hundred volts or less in the cut-off state. This reduction of E_{G2} has the further desirable results of strengthening the convergence effect of the convex lens formed at the exit aperture of the second grid **4**, preventing divergence of the electron beam, and enhancing the twin-vex effect.

FIG. **15** is a drive chart illustrating drive characteristics of the conventional QPF electron gun, the electron gun of the present invention with the second grid **4** biased at 700 V, and the electron gun of the present invention with the second grid **4** biased at 380 V, these bias voltages being relative to the cathode voltage E_{KO} in the cut-off state. Beam current I_K is shown on the vertical axis, and drive voltage E_d on the horizontal axis. The drive voltage E_d is defined as:

$$E_d = E_{KO} - E_K$$

It can be seen that the invention with a 380-V cut-off voltage and the conventional electron gun with a 700-V cutoff voltage have equivalent drive characteristics.

By lessening the increase in spot size that occurs with increasing beam current, the invention can give good resolution at high current levels, and can reduce variation in beam spot size.

Although the drawings have shown an electron gun for a color cathode-ray tube with three beams, the invention can off course also be applied to monochrome cathode-ray tubes with a single electron beam, and those skilled in the art will recognize that further modifications can be made without departing from the scope of the invention as claimed below.

What is claimed is:

1. An electron gun for a cathode-ray tube, comprising:
   - a triode having a cathode for emitting an electron beam, a first electrode with an aperture having a first diameter for passage of said electron beam, and a second electrode with an aperture having a second diameter for passage of said electron beam and disposed adjacent to said first electrode; and
   - a main lens disposed between said second electrode and a screen for focusing said electron beam onto said screen; wherein
   - said second electrode has a thickness of no more than one-half of said second diameter; and
   - said first electrode and said second electrode are mutually separated by a distance of no more than one-half of said first diameter, and no more than one-half of said second diameter.

2. The electron gun of claim **1**, wherein said cathode and said second electrode have a potential difference of less than four hundred volts when said cathode is driven at a cut-off voltage.

3. The electron gun of claim **1**, wherein said triode also comprises a third electrode with an aperture for passage of said electron beam, said second electrode is disposed between said first electrode and said third electrode, and an axial potential gradient of at least ten kilovolts per millimeter exists between said second electrode and said third electrode.

4. A method for reducing spot size on screen of cathode ray tube including a triode having a cathode for emitting an electron beam, a second electrode having an aperture of a second diameter for passing said electron beam, and a first electrode disposed between said cathode and said second electrode and having an aperture of a first diameter for passing said electron beam, and a main lens disposed between said second electrode and a screen for focusing said electron beam onto said screen, comprising the steps of:
   - limiting said thickness of said second electrode to no more than one-half of said second diameter; and
   - separating said first electrode and said second electrode by a distance of no more than one-half of said first diameter, and no more than one-half of said second diameter.

5. The method of claim **4**, further comprising the step of:
   - limiting a potential difference of said cathode and said second electrode to less than four hundred volts when said cathode is driven at a cut-off voltage.

6. The method of claim **4**, further comprising the steps of:
   - passing said electron beam through an aperture of a third electrode disposed adjacent to said second electrode and on the opposite side of said first electrode; and
   - applying an axial potential of at least ten kilovolts per millimeter between said second electrode and said third electrode.

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